

3438 US

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (PCT/IB/308)

09/269148

INTERNATIONAL APPLICATION NO.  
PCT/EP97/02086INTERNATIONAL FILING DATE  
April 24, 1997PRIORITY DATE CLAIMED  
September 12, 1996

## TITLE OF INVENTION

METHOD FOR THE DETERMINATION OF COMBUSTION MISFIRES

## APPLICANT(S) FOR DO/EO/US

Thomas HOPF and Ulrich STAUFENBERG

MAR 12 1999

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (PCT/IPEA/401)
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date/
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau)
  - b. ☒ has been transmitted by the International Bureau. (PCT/IB/308)
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)). 11 pages including **Abstract** specification, claims, drawings Figs. 1-5 (5 sheets) with English translations\* of the German legends in Fig. 5 and the English word Figure on all sheets instead of the German words under PCT Rule 49.5(d)
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau
  - c. ☐ have not been made, however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (2 pages) - unsigned
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98. (PTO-1449) Relevance is noted in the enclosed International Search Report (European Patent Office), 2 pages in English. Also the reference DE (German) 4119399 is discussed on page 1 of the specification.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
13. ☒ A **FIRST** preliminary amendment. ENTER PRELIMINARY AMENDMENT BEFORE CALCULATING FEES  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: WO 98/11416 (cover page)
17. ☒ PCT/.../401
18. ☒ PCT/IB/308
19. ☒ CLAIM IS HEREBY MADE OF THE BENEFIT OF THE FILING DATE OF GERMAN PATENT APPLICATION 196 37 094.9 FILED SEPTEMBER 12, 1996 UNDER 35 USC 119
20. ☒ Express mail mailing label no. EI750168100US date of deposit March 12, '99

\* APPLICANTS RESERVE JUDGEMENT TO USE THE ENGLISH LEGENDS ON THE COVER PAGE OF WO 98/11416 IF THEY ARE CLEARER TRANSLATIONS.

17. ☒ The following fees are submitted.

Basic National Fee (37 CFR 1.492(a)(1)-(5)):

Search Report has been prepared by the EPO or JPO..... \$840.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)

..... \$640.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482)

but international search fee paid to USPTO (37 CFR 1.445(a)(2)).. \$710.00

Neither international preliminary examination fee (37 CFR 1.482) nor

international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... \$950.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)

and all claims satisfied provisions of PCT Article 33(2)-(4)..... \$90.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

CALCULATIONS PTO USE ONLY

\$ \$840.

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

| Claims   | Number Filed | Number Extra | Rate       |
|--|--------------|--------------|------------|
| Total Claims                                   | 7 -20 =      | 0            | X \$22.00  |
| Independent Claims                             | 1 -3 =       | 0            | X \$74.00  |
| Multiple dependent claims(s) (if applicable) * |              |              | + \$230.00 |

\$ 0

\$ 0

\$ 0

TOTAL OF ABOVE CALCULATIONS =

\$ \$840.

Reduction by 1/2 for filing by small entity, if applicable Verified Small Entity statement  
must also be filed (Note 37 CFR 1.9, 1.27, 1.28)

\$

SUBTOTAL =

\$ \$840.

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(f))

\$ 0

TOTAL NATIONAL FEE =

\$ \$840.

Fee for recording the enclosed assignment (37 CFR 1.21(h)) The assignment must be  
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$

TOTAL FEES ENCLOSED =

\$ \$840.

Amount to be:

refunded \$

charged \$

a. ☒ A check in the amount of \$ 840 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
overpayment to Deposit Account No. 06-0105 A duplicate copy of this sheet is enclosed.NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR  
1.137(a) or (b)) must be filed and granted to restore the application to pending status.\* PLEASE ENTER PRELIMINARY AMENDMENT BEFORE CALCULATING  
CLAIM FEES

SEND ALL CORRESPONDENCE TO:

MARTIN A. FARBER

866 United Nations Plaza (Suite 473)

New York, NY 10017

TEL.: (212) 758-2878

FAX: (212) 758-2913

SIGNATURE

NAME MARTIN A. FARBER

22,345

REGISTRATION NUMBER

103020-07069260

09/269148

510 Rec'd PCT/PTO 12 MAR 1999

3438US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Express Mail Label No. EI750168100US  
Deposited March 12, 1999

USA PCT National Stage Patent Application  
PCT/EP97/02086 filed April 24, 1997

Thomas Hopf, et al

METHOD FOR THE DETERMINATION  
OF COMBUSTION MISFIRES

Priority: German Patent Application  
196 37 094.9 filed September 12, 1996

Hon. Commissioner of Patents and Trademarks  
Washington, D.C. 20231

S I R :

PRELIMINARY AMENDMENT

Please amend this application simultaneously with filing the  
accompanying translation and this USA National Stage application  
as follows:

IN THE ABSTRACT

(UNNUMBERED PAGE 11)

Lines 1-4, delete "VDO ... 3438"

Line 10, delete "according ... invention,"

Line 18, delete "(Figure 5)"

IN THE SPECIFICATION

PAGE 1

0036410-00001  
TOP SECRET

first unnumbered lines 1-5, delete "VDO ... Description"

Line 6, before this line, after the title, insert --FIELD AND  
BACKGROUND OF THE INVENTION--

Line 31, before this line insert --SUMMARY OF THE INVENTION--

Line 32, change "specify" to --provide--

PAGE 2

Lines 1-2, delete these lines

Line 15, change "proposed" to --provided--

PAGE 4

Lines 10-12, delete these lines

Line 17, change this line to read:

--BRIEF DESCRIPTION OF THE DRAWINGS

With the above and other objects in view, the invention  
will be understood from the accompanying description of a  
preferred embodiment when considered with the accompanying  
drawings, of which--

Line 30, after "misfires," insert --and--

Line 33, before this line insert --DETAILED DESCRIPTION OF THE  
PREFERRED EMBODIMENT--

IN THE CLAIMS

PAGE 9

Lines 1-4, delete "VDO ... 3438"

Unnumbered line 5, change "Patent claims" to --WE CLAIM:--

(THE FOLLOWING LINE NUMBERS REFER TO THE LINES OF  
EACH CLAIM EACH STARTING WITH THE LINE NUMBER 1)

Claim 3, Line 1, delete "or 2"

Claim 4, Line 1, change "one ... 3" to --claim 1--

Claim 5, Lines 1-2, change "one ... claims" to --claim 1--

PAGE 10

Claim 6, Lines 1-2, change "one ... claims" to --claim 2--

Claim 7, Lines 1-2, change "one ... claims" to --claim 1--

R E M A R K S

This Amendment accompanying this application is being made to amend the claims in order to avoid multi-dependent claim fees and to place this application in proper form and condition for examination. No multi-dependent claim fees should apply.


09269149-070691  
T09020-84T69269

The Examiner is respectfully requested to enter this Amendment prior to calculation of the filing fee as of the national stage filing date, and to provide an action on the merits.

The specification, abstract and claims have also been amended for formal improvement to comply with USA practice.

Respectfully submitted

Thomas Hopf, et al

by:   
MARTIN A. FARBER  
Attorney for Applicants  
Registered Representative  
Registration No.: 22,345

866 United Nations Plaza  
Suite 473  
New York, NY 10017  
(212) 758-2878

09269148-070601

Description

Method for the determination of combustion misfires

5

The invention relates to a method for the determination of combustion misfires in an internal combustion engine having a plurality of cylinders.

A diagnostic device for internal combustion engines is known from DE 41 19 399 C2, said diagnostic device, whilst having a simplified design, making it possible to detect ignition or combustion problems in internal combustion engines more reliably. This is due to the presence of pressure detection means (sensors) which detect the internal pressure of the cylinders of the internal combustion engine and emit a corresponding output signal, this output signal being fed to a differentiating means which differentiates the output signal and emits a differentiated output signal. The disadvantage of this diagnostic device is that pressure detection means are necessary for detecting the internal pressure of the cylinders of the internal combustion engine, thus necessitating additional design measures on the crankcase of the internal combustion engine, with the result that a higher outlay in terms of assembly is involved and there is a source of sealing faults. Moreover, the pressure detection means are subjected to increased requirements, particularly as regards thermal resistance, so that these pressure detection means are correspondingly cost-intensive.

The object on which the invention is based, therefore, is, by simple means, to specify a method by which the combustion misfires in at least one cylinder of the internal combustion engine can be determined reliably.

09269148-070604

This object is achieved by means of the features of patent claim 1.

It is known that braking of the crankshaft of the internal combustion engine occurs in the case of combustion misfires. This braking can be detected by measuring the variation in successive 180° times. However, the braking (negative acceleration) of the crankshaft is not sufficient, alone, for recognizing combustion misfires or for distinguishing them from other influences which cause negative angular acceleration of the crankshaft (for example, influences arising from the drive train of a vehicle in which the internal combustion engine is arranged). Consequently, in order to determine combustion misfires, it is proposed, according to the invention, that the crank circle of the crankshaft (that is to say, one revolution) be divided into four regions (segments), each of 90° in the case of a four-cylinder internal combustion engine, so that two compression times and two expansion times occur during each revolution. In a six-cylinder internal combustion engine, the division into six segments, each of 60°, that is to say, in general, a crank circle (360°) is divided by the number of cylinders of the internal combustion engine, thus resulting in the division into segments and the segment size. The determination of the combustion misfire is based on determining at least two successive compression times and expansion times for at least one cylinder of the internal combustion engine, and, in order to determine combustion misfires, a comparison, in particular an addition or a subtraction, of the change in the compression times with the change in the expansion times is carried out and the result of the comparison is a measure of a combustion misfire. If the comparison result exceeds (or falls short of) an upper (lower) predeterminable limit value once or more than once, this is indicated optically and/or acoustically after statistic further processing and can be stored in a fault memory, and, furthermore, the supply of the

09259148-070501



fuel to this cylinder can be interrupted (for example, the corresponding injection valves are deactivated), whilst further reactions may also be carried out (for example, blocking of  $\lambda$ -control and of full-load enrichment).

In a development of the invention, the method is carried out as a function of predeterminable parameters of the internal combustion engine and/or of predeterminable ambient parameters of the internal combustion engine. Thus, for example, the method is not carried out as a function of the operating temperature of the internal combustion engine or is so carried out, using predeterminable limit values. The predeterminable ambient parameters of the internal combustion engine are, for example, acceleration and deceleration operations of the vehicle, since these have a direct effect on the measured expansion and compression times and the 180° times due to the changes in engine speed, so that these ambient influences are taken into account in the determination of combustion misfires.

It is advantageous, furthermore, that the availability of the comparison result makes it directly possible to have evidence as to whether there is a combustion misfire or not and, on the basis of this, a rapid reaction (for example, fault warning, interruption in the fuel supply or the like) can take place or takes place either after a single combustion misfire or after a plurality of successive combustion misfires.

In a development of the invention, the method is carried out for each cylinder, so that combustion misfires are determined and recognized for each individual cylinder and the affected cylinder can be at least temporarily deactivated by interrupting the fuel supply, so that, at all events, emergency operation is still ensured if an individual cylinder has combustion misfires not only temporarily, but permanently.

In a development of the invention, after the detection of at least one combustion misfire, in

09269149-070601  
T09269149-070601

particular after a predeterminable number of combustion misfires, on a cylinder, a fault signal is generated and emitted. This fault signal, which may also be stored in a memory unit of the engine control device, signals to the vehicle driver that there is a defect and that he should find a workshop in order to eliminate it and avoid further damage (in particular, to a catalyst which is destroyed by fuel which is not burnt).

Further method steps are specified in the subclaims, from which corresponding advantages may be gathered.

The method according to the invention is explained in more detail below, a device for carrying out the method also being described, the invention not being restricted to this device.

Details of the particular Figures:

Figure 1 shows a cylinder pressure profile of a four-cylinder internal combustion engine, with the 90° and 180° crankshaft times being illustrated,

Figure 2 shows a profile of the crankshaft acceleration and of the 90° times during normal engine operation,

Figure 3 shows the change in the crankshaft acceleration and in the 90° times which is caused by combustion misfires,

Figure 4 shows the change in the crankshaft acceleration and in the 90° times which is caused by double misfires,

Figure 5 shows a device for evaluating and processing the combustion misfires recognized.

Figure 1 shows the cylinder pressure profile of a four-cylinder internal combustion engine, with the 90° and 180° crankshaft times being illustrated. The crank circle is divided into four segments, each of 90°, for example the zero position being at the ignition TDC of the first and of the fourth cylinder, so that two compression times ( $t_{verd}$ ) and expansion

00259143-010501

times ( $t_{exp}$ ) occur during each revolution. The period (PT) can be formed from the sum of a compression time and the associated expansion time between two successive TDC's of various cylinders. Advantageously, in this case, the method for the determination of combustion misfires is carried out as a function of predeterminable ambient parameters of the internal combustion engine, these being, in addition to those already mentioned, the output signal from the sensor for determining the period. This is carried out, for example, by comparing two successive  $180^\circ$  times (or the like) with one another. Since this takes place in the nonstationary mode, these measured times must be essentially identical, and, for example, the difference resulting from the differentiation of the two times can be taken into account in the further method for the determination of combustion misfires. Consequently, in particular, manufacturing tolerances, tooth flank errors and the like of the sensor are compensated.

Figure 2 shows the profile of the crankshaft acceleration and of the  $90^\circ$  times during normal engine operation. It can be seen, here, that the acceleration of the crankshaft is positive during an expansion time, whereas it is negative during the compression time. During normal engine operation, positive and negative accelerations alternate.

Figure 3 shows, in contrast to Figure 2, changes in the crankshaft acceleration and in the  $90^\circ$  times which are caused by combustion misfires. A combustion misfire (between a  $180^\circ$  crank angle and a  $270^\circ$  crank angle) results in lower positive acceleration and higher negative acceleration of the crankshaft. The following compression and expansion times also change as a result, so that they are at a higher level than before.

Figure 4 shows the change in the crankshaft acceleration and in the  $90^\circ$  times which is caused by double misfires. The lower positive acceleration or the higher negative acceleration of the crankshaft results,

in the subsequent time, in a further rise of the compression and expansion times which can likewise be evaluated, in exactly the same way as in Figure 3, by means of the method according to the invention.

5           Figure 5 shows a device for evaluating and processing recognized combustion misfires.

          A crankshaft sensor signal (a camshaft sensor signal may also be envisaged) is fed to a tooth flank correction means 1, in which, as already described, two  
10 successive 180° times and associated 90° times (two expansion and compression times) are compared with one another and a value is formed which is taken into account in the following combustion misfire determination. Compensation 2 is subsequently carried  
15 out during the nonstationary mode, so that, for example in the case of a sudden load decrease (gas throttling), which is also superposed by a likewise rapid engine speed change due to vibrations in the drive train, a combustion misfire would be recognized, but would not constitute a combustion misfire. The formation of a characteristic value for the combustion misfire is designated by the reference numeral 3, the formation of further value, without the nonstationary mode being taken into account, being formed from the crankshaft  
20 sensor signal at reference numeral 4. One of the two or both values can be read out, with limited change, from a characteristic map plotted, in particular, against load and engine speed, one value being capable of correcting the other. Reference numeral 5 designates threshold value determination, in which a threshold value or a value range, if appropriate taking into account the load in the internal combustion engine, is formed for the value formed in 4. Threshold value determination 6 is likewise carried out, in which a  
25 basic threshold value or a value range is determined for the combustion misfire value formed at 3. Temperature compensation 7, which takes the engine temperature into account, may be carried out for one or both threshold values 5, 6. In a change limitation  
30

09259148-070504

means 8, these threshold values or one threshold value can be taken into account as a function of predeterminable parameters of the internal combustion engine and/or of predeterminable ambient parameters of the internal combustion engine, such as, for example, an abrupt change in the accelerator pedal position, sharp vibration excitation caused by terrain influences or the like.

An interrogation means 9 interrogates whether a combustion misfire is to be determined or not. If the combustion misfire values determined in 3 or 4 are above or below the determined threshold values 5 or 6 (or outside the permissible value range), no determination of combustion misfires is carried out. If determination is to be carried out, an interrogation means 10 interrogates whether detection is permitted or not. Thus, for example, detection is not permitted when the speed of the internal combustion engine is below a predeterminable speed (for example, a minimum speed below idling speed), or predeterminable load and/or temperature ranges are not maintained. If, for example, the engine temperature is below a predeterminable temperature, inhomogeneous mixture treatment and a marked increase in friction-related power output at these temperatures result in increased running noise, which assumes orders of magnitude, which is also to be expected in the case of combustion misfires. Below this temperature, therefore, there is no detection of combustion misfires, so that deactivation 11 of the combustion misfire diagnosis is carried out.

When detection 10 is permitted, statistic evaluation 12 takes place, as to whether the combustion misfire or combustion misfires may lead to catalyst damage and/or to emission limit values being exceeded. If catalyst damage may occur, a reaction 13 to a catalyst-damaging combustion misfire rate is carried out, for which purpose, for example, the respective cylinder which has combustion misfires is cut out. Furthermore, as a result of this and also as a result

09259448-070501

of emission limit values being exceeded, a fault signal 14 is generated, which is indicated to the vehicle driver optically/acoustically, is stored in an on-board diagnostic device and is read out later or as a function of which the supply fuel to the affected cylinder or cylinders is at least temporarily interrupted.

List of the abbreviations used

10

TDC: Top dead center of a cylinder

°KW: Angular sector which the crankshaft of the internal combustion engine covers

15

ϕZyl.i: The ignition timing of a cylinder (i = 1, 2, 3, 4, etc.)

t<sub>exp</sub>: Expansion time of a cylinder

t<sub>verd</sub>: Compression time of a cylinder

PT: Period for an angular sector

a<sub>KW</sub>: Acceleration of the crankshaft

20

VA: Combustion misfire

$$\begin{aligned} VA &= \frac{t_{\text{verd}, i} - t_{\text{verd}, i-1}}{t_{\text{exp}, i} - t_{\text{exp}, i-1}} \\ &= \frac{\Delta t_{\text{verd}}}{\Delta t_{\text{exp}}} \end{aligned}$$

or:

25

$$VA = \Delta t_{\text{verd}} - \Delta t_{\text{exp}}$$

09259149-070604  
T09040-070604

VDO Adolf Schindling AG

Rüsselsheimer Str. 22  
60326 Frankfurt  
K46-R/GR-mh  
3438

**Patent claims**

- 5 1. A method for the determination of combustion misfires in an internal combustion engine having a plurality of cylinders, wherein at least two successive compression times and expansion times are determined for at least one cylinder of the internal combustion  
10 engine, for the determination of combustion misfires a comparison of the change in the compression times with the change in the expansion times being carried out, and the result of the comparison being a measure of a combustion misfire.
- 15 2. The method as claimed in claim 1, wherein the method is carried out as function of predeterminable parameters of the internal combustion engine and/or of predeterminable ambient parameters of the internal combustion engine.
- 20 3. The method as claimed in claim 1 or 2, the method being carried out for each cylinder of the internal combustion engine.
4. The method as claimed in one of claims 1 to 3, wherein, after the detection of at least one combustion  
25 misfire, in particular after a predeterminable number of combustion misfires, a fault signal is generated and emitted.
5. The method as claimed in one of the preceding claims, wherein a threshold value for the measure of a  
30 combustion misfire is formed at least as a function of at least one parameter of the internal combustion engine, no fault signal being generated if the comparison result exceeds or falls short of this threshold value.

00269448-070604

6. The method as claimed in one of the preceding claims, wherein the method is not carried out in the case of a deviation from permissible value ranges for the predeterminable parameters of the internal combustion engine and/or for the predeterminable ambient parameters of the internal combustion engine.

7. The method as claimed in one of the preceding claims, used in an on-board diagnostic device at least for the internal combustion engine driving a vehicle, in particular a passenger vehicle.

09259149-070501  
T09040-84T09200



VDO Adolf Schindling AG

Rüsselsheimer Str. 22  
60326 Frankfurt  
K46-R/GR-mh  
3438

## Abstract

### Method for the determination of combustion misfires

A method for the determination of combustion misfires in an internal combustion engine having a plurality of cylinders, there being provision, according to the invention, for determining at least two successive compression times and expansion times for at least one cylinder of the internal combustion engine, for the determination of combustion misfires a comparison of the change in the compression times with the change in the expansion times being carried out, and the result of the comparison being a measure of a combustion misfire.

(Figure 5)

09269149-070504  
T05040-070504

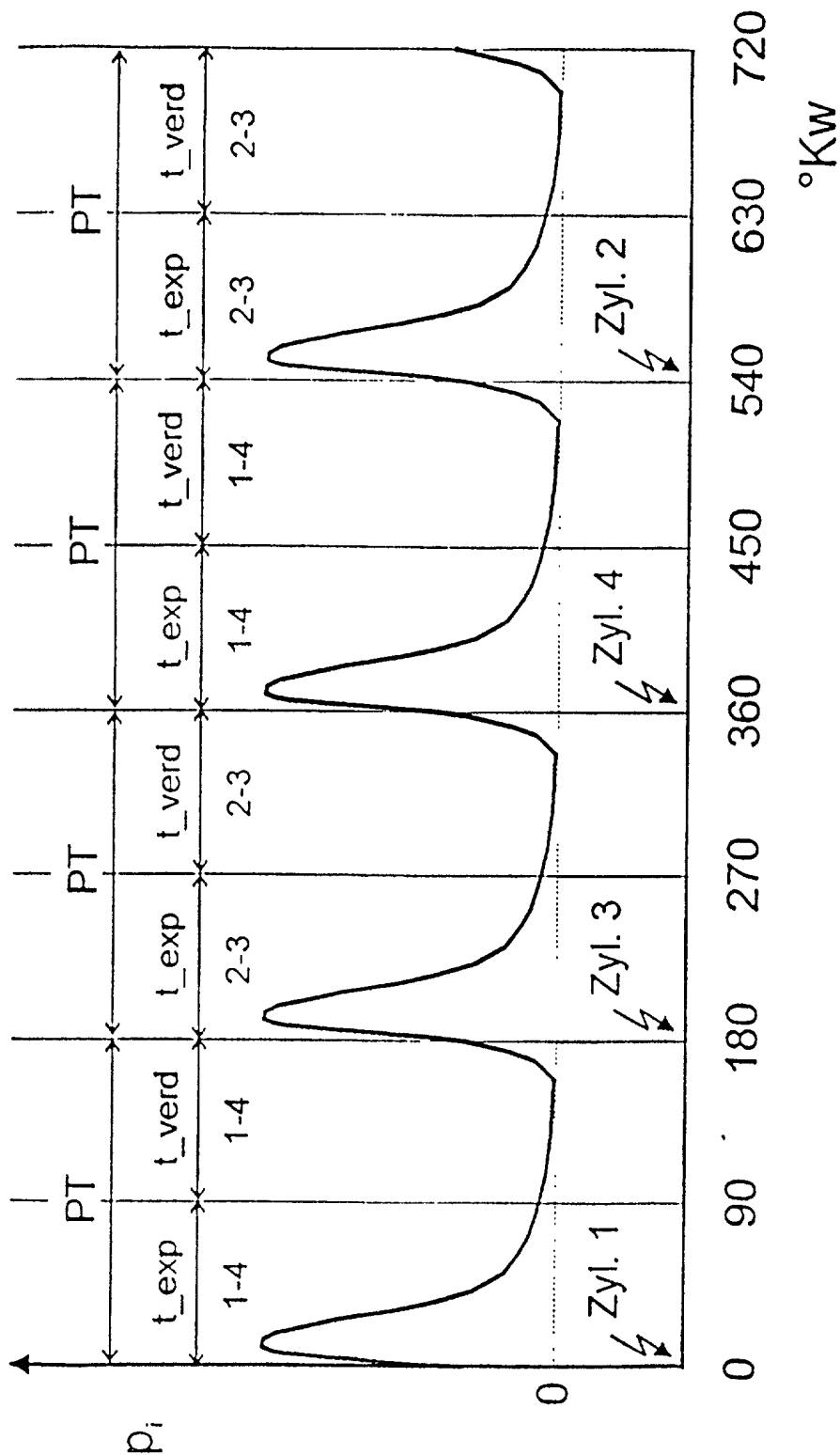


Figure1

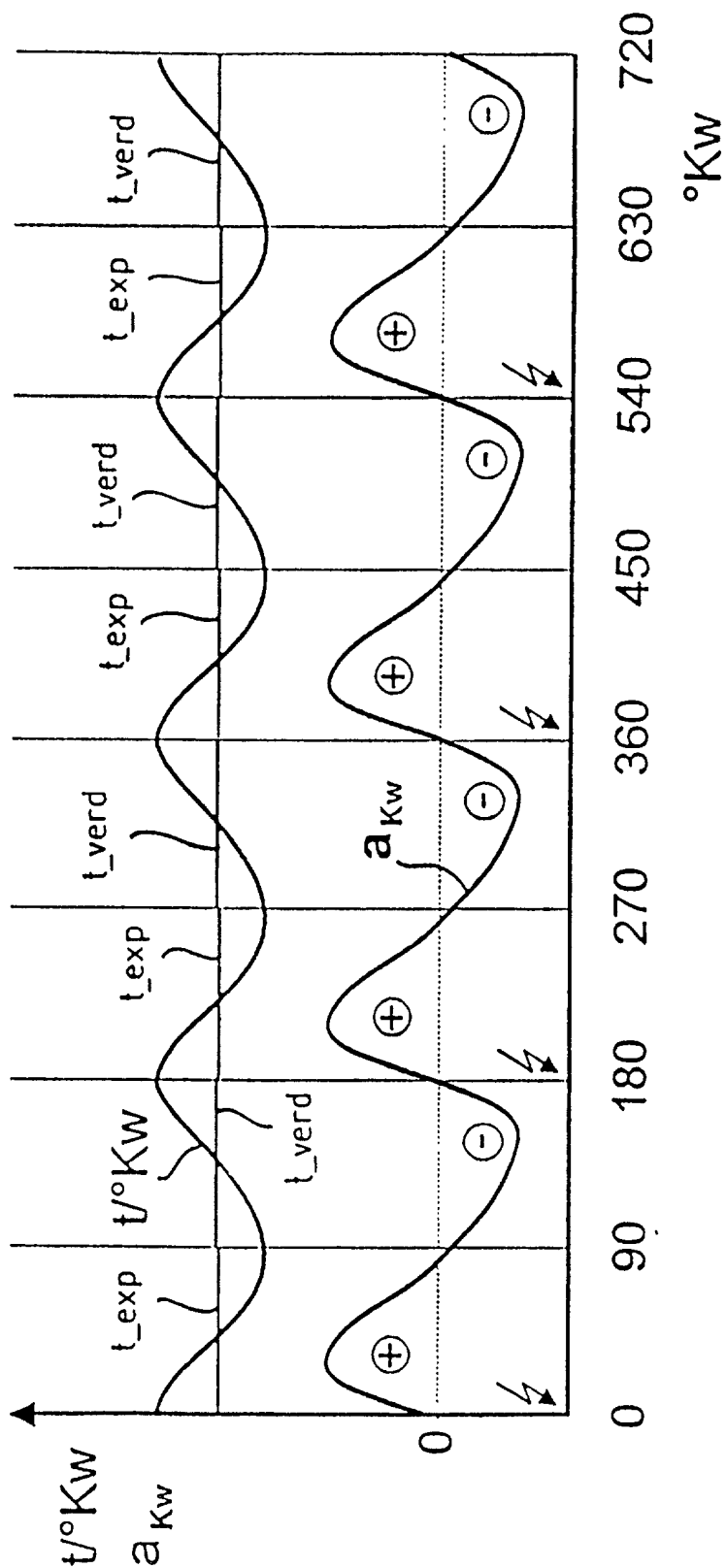


Figure2



Figure 3

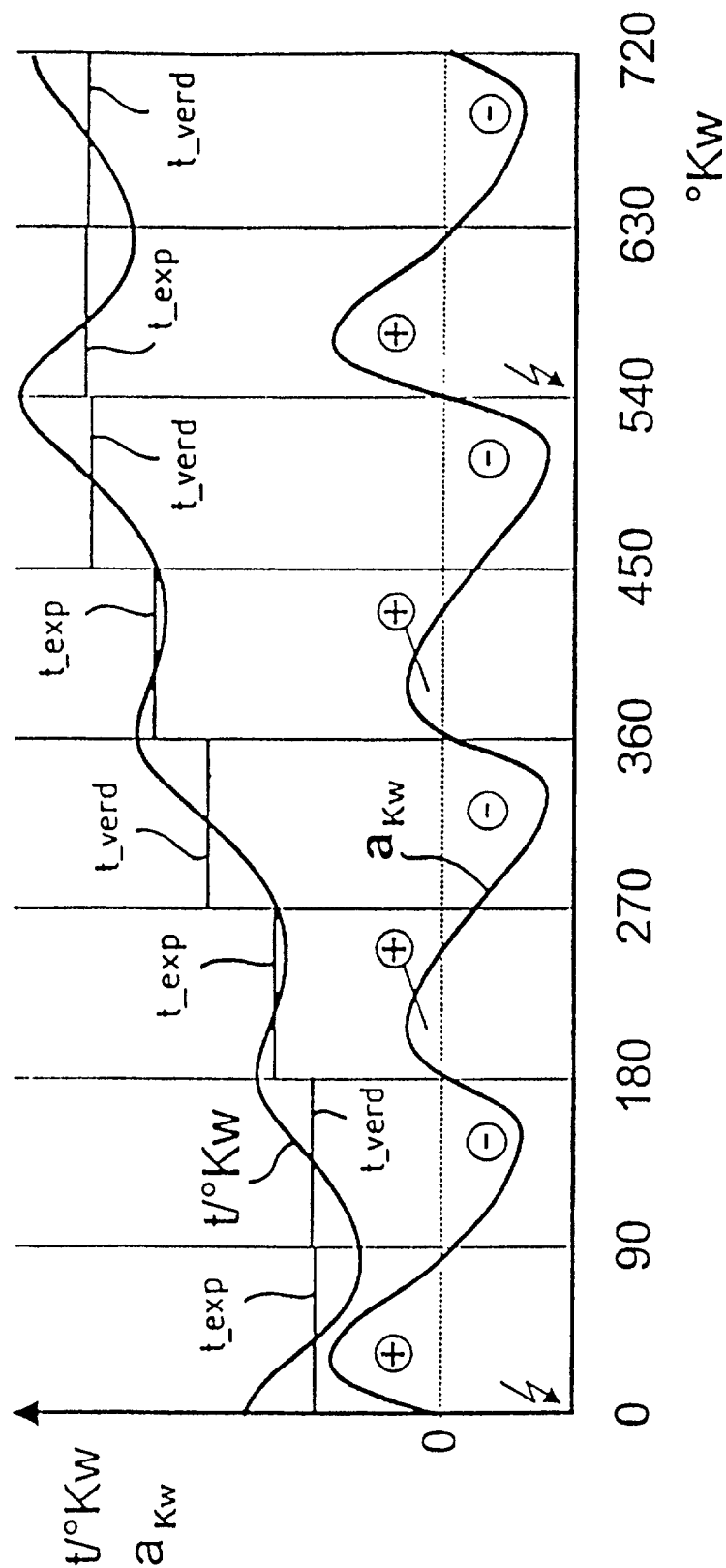
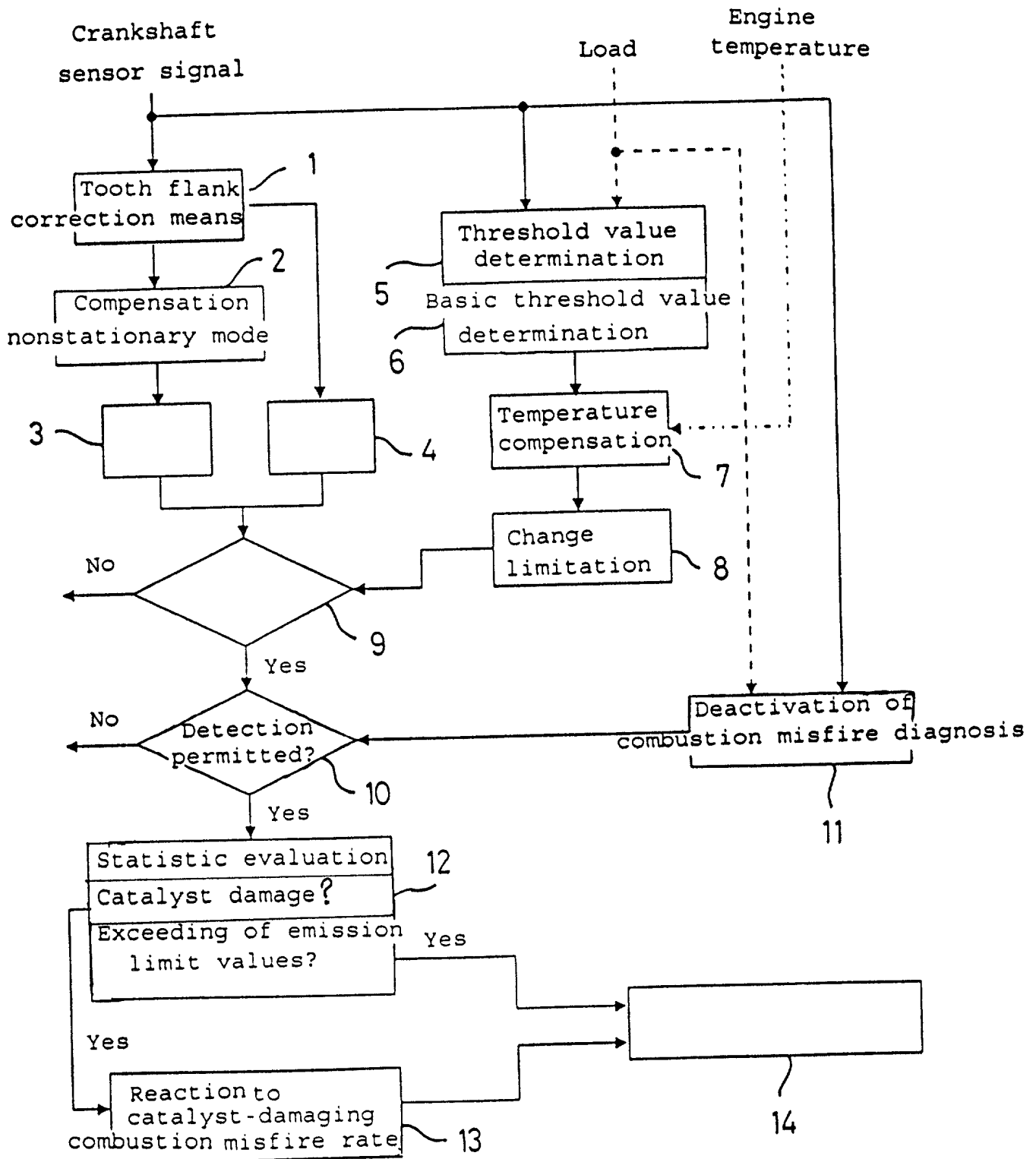


Figure4





3438 US

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

USA PCT National Stage Patent Application  
PCT/EP97/02086 filed April 24, 1997

Thomas Hopf, et al

Serial No.: 09/269,148

First Submission: Filed March 12, 1999

METHOD FOR THE DETERMINATION OF COMBUSTION MISFIRES

-----  
CERTIFICATE OF MAILING ON LAST PAGE  
-----

Hon. Commissioner of Patents & Trademarks

Washington, D.C. 20231

S I R :

RESPONSE TO 1) NOTIFICATION OF MISSING REQUIREMENTS UNDER 35 USC  
371 IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)  
AND 2) NOTIFICATION OF DEFECTIVE OATH OR DECLARATION, AND 3)  
RESPONSE TO DECISION ON PETITION, AND SUBMISSION OF  
DECLARATION AND SURCHARGE

In response to the Office Action (copy enclosed) dated November 8, 1999, and Decision on Petition dated June 5, 2001, respectfully submitted herewith is the signed and dated Combined Declaration of the inventors (2 pages) in compliance with 37 CFR 1.63 and 1.66 or 1.68 and 37 CFR 1.497(a) and (b), identifying the application by PCT International application no. and international filing date and with power of attorney.


Enclosed is check 13878 \$130.00 the surcharge fee for providing the oath or declaration later than the appropriate 30 months from the earliest priority filing date.

The English translation of the PCT application and the Preliminary Amendment were submitted on March 12, 1999. Please enter the Preliminary Amendment before calculating claim fees.

The Commissioner is hereby authorized to charge any or additional fees which may be required, or credit any overpayment to deposit account no. 06-0105.

Respectfully submitted,


Thomas Hopf, et al

by:   
MARTIN A. FARBER  
Attorney for Applicants  
Registered Representative  
Registration No. 22,345

CERTIFICATE OF MAILING UNDER 37 CFR SECTION 1.8(a)

I hereby certify that the accompanying Response to Notification of Missing Requirements under 35 USC 371 in the United States Designated/ Elected Office (DO/EO/US) and Notification of Defective Oath or Declaration, signed Combined Declaration (2 pages), and check 13878 \$130.00 surcharge are being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents & Trademarks, Washington, D.C. 20231, on July 3, 2001.

Dated: July 3, 2001

  
Martin A. Farber

866 United Nations Plaza  
Suite 473  
New York, NY 10017  
(212) 758-2878

07/12/2001 ATRAM1 00000002 09289148

01 FC1154

130.00 DP



# COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

(Includes Reference to PCT International Applications)

ATTORNEY'S SECRET NUMBER

3438 US

JUL 06 2007

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Method for the determination of combustion misfires

the specification of which (check only one item below).

☐ is attached hereto.

☐ was filed as United States application

Serial No. \_\_\_\_\_

on \_\_\_\_\_

and was amended

on \_\_\_\_\_ (if applicable).

☒ was filed as PCT international application

Number PCT/EP97/02086

on April 24, 1997

and was amended under PCT Article 19

on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

## PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

| COUNTRY<br>(if PCT indicate PCT ) | APPLICATION NUMBER | DATE OF FILING<br>(day month year) | PRIORITY CLAIM<br>(under 35 U.S.C. 119)                             |
|-----------------------------------|--------------------|------------------------------------|---|
| Germany                           | 196 37 094.9       | 12/09/1996                         | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
|                                   |                    |                                    | <input type="checkbox"/> YES <input type="checkbox"/> NO            |
|                                   |                    |                                    | <input type="checkbox"/> YES <input type="checkbox"/> NO            |
|                                   |                    |                                    | <input type="checkbox"/> YES <input type="checkbox"/> NO            |
|                                   |                    |                                    | <input type="checkbox"/> YES <input type="checkbox"/> NO            |

# Combined Declaration For Patent Application and Power of Attorney (Continued)

(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER  
3438 US

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

## PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

| U.S. APPLICATIONS                     |                  | STATUS (Check one)                    |         |           |
|---------------------------------------|------------------|---------------------------------------|---------|-----------|
| U.S. APPLICATION NUMBER               | U.S. FILING DATE | PATENTED                              | PENDING | ABANDONED |
|                                       |                  |                                       |         |           |
|                                       |                  |                                       |         |           |
|                                       |                  |                                       |         |           |
| PCT APPLICATIONS DESIGNATING THE U.S. |                  |                                       |         |           |
| PCT APPLICATION NO                    | PCT FILING DATE  | U.S. SERIAL NUMBERS ASSIGNED (if any) |         |           |
|                                       |                  |                                       |         |           |
|                                       |                  |                                       |         |           |
|                                       |                  |                                       |         |           |

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number) MARTIN A. FARBER, Esq., Reg. No. 22,345  
866 United Nations Plaza, Suite 473  
New York, NY 10017  
U.S.A.

Send Correspondence to: MARTIN A. FARBER  
866 United Nations Plaza, Suite 473  
New York, NY 10017

Direct Telephone Calls to:  
(name and telephone number)  
MARTIN A. FARBER  
(212) 758-2878

|     |                         |             |                          |                        |
|-----|-------------------------|-------------|--------------------------|------------------------|
| 201 | FULL NAME OF INVENTOR   | FAMILY NAME | FIRST GIVEN NAME         | SECOND GIVEN NAME      |
|     | RESIDENCE & CITIZENSHIP | CITY        | STATE OR FOREIGN COUNTRY | COUNTRY OF CITIZENSHIP |
|     | POST OFFICE ADDRESS     | CITY        | STATE & ZIP CODE/COUNTRY |                        |
| 202 | FULL NAME OF INVENTOR   | FAMILY NAME | FIRST GIVEN NAME         | SECOND GIVEN NAME      |
|     | RESIDENCE & CITIZENSHIP | CITY        | STATE OR FOREIGN COUNTRY | COUNTRY OF CITIZENSHIP |
|     | POST OFFICE ADDRESS     | CITY        | STATE & ZIP CODE/COUNTRY |                        |
| 203 | FULL NAME OF INVENTOR   | FAMILY NAME | FIRST GIVEN NAME         | SECOND GIVEN NAME      |
|     | RESIDENCE & CITIZENSHIP | CITY        | STATE OR FOREIGN COUNTRY | COUNTRY OF CITIZENSHIP |
|     | POST OFFICE ADDRESS     | CITY        | STATE & ZIP CODE/COUNTRY |                        |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon

|                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| SIGNATURE OF INVENTOR 201 | SIGNATURE OF INVENTOR 202 | SIGNATURE OF INVENTOR 203 |
| DATE                      | DATE                      | DATE                      |